DOCUMENT RESUME

ED 306 035 PS 017 972

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TITLE Participation at the Prewriting Table: The Effects of Preschool Environmental Enhancements.
PUB DATE May 89
NOTE 25p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Classroom Environment; Classroom Research; Classroom Techniques; *Cues; *Learning Activities; *Learning Centers (Classroom); *Preschool Children; Preschool Education; Student Participation; *Teacher Role; *Writing Readiness

ABSTRACT

Effects of environmental enhancements on the participation of 21 preschoolers at a prewriting table during free-choice activities were examined during one school year. A reversal experimental design compared three cumulatively richer enhancements. Enhancements were: (1) two skill levels of materials; (2) two skill levels of materials with "prompts to attend the table" directed to six children who had low Brigance K and I Screen scores; and (3) two skill levels of materials, prompts, and teacher presence at the table. Data collected on a time-sampling basis showed that in comparison to baselines, voluntary and constructive participation at the prewriting table increased to significantly higher levels as the enhancements intensified, even though six other free-choice classroom learning centers were simultaneously offered. Prior to implementation of the procedures, midway, and at the end of the study, children were tested on two subtests of the Brigance K and I Screen: (1) prints personal data; and (2) visual motor skills. The results indicated that Brigance scores increased. (RH)

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Participation at the Prewriting Table:
The Effects of Preschool Environmental Enhancements

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Running head: PREWRITING TABLE: ENVIRONMENTAL ENHANCEMENTS

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Submitted to
Early Childhood Research Quarterly
May, 1989

Abstract

This study examined the effects of environmental enhancements on the participation of 21 children at the Prewriting Table during the preschool free-choice period across a school year. A reversal experimental design (A1, B, A2, C, A3, D1, A4, D2) compared three cumulatively richer enhancements with the Condition A baselines of one skill level materials at the Prewriting Table. The enhancements were: two skill levels of materials (Condition B); two skill levels, and prompts to attend the Table to six children who had low Brigance scores (Condition C); and two skill levels, prompts, and teacher presence at the Table (Condition D). Data collected on a time-sampling basis showed participation increased to significantly higher levels as the enhancements intensified in comparison to baselines. Prior to the implementation of the procedures, midway, and at the end of the study, children were tested on two subtests of the Brigance K & I Screen: (1) prints personal data; and (2) visual motor skills. Brigance scores increased also.

Participation at the Prewriting Table:
The Effects of Preschool Environmental Enhancements

Prewriting activities under the aegis of fine motor skills have long been included in prekindergarten developmental screening instruments (e.g., Carolina Developmental Profile, 1976; DIAL- Developmental Indicators for the Assessment of Learning, 1975; Denver Developmental Screening Test, 1975). The value of such prewriting tasks is that they lay the foundation for handwriting taught later in kindergarten and first grade (cf., Morrison, 1988). Lamme (1979) elaborated on this foundation by explaining that before letters are written a child needs to have mastered the preskills of small muscle development, eye-hand coordination, holding utensils, basic strokes, letter perception, and orientation toward the printed language.

This study, over a school year, focused on arranging the environment in the preschool classroom to provide children the opportunity and support to practice fine motor skills related to handwriting. Of special concern in planning and implementing this research was the National Association for the Education of Young Children (1986) guideline for developmentally appropriate practice in early childhood programs. To accommodate this dual purpose of providing fine motor practice and using procedures suitable for young children a Prewriting Table was available daily as a free-choice center.

The environmental changes related to the Prewriting Table involved concurrent low- and high-level fine motor activities, teacher prompts to specific children to attend the center, and teacher presence at the Table. The effectiveness of these environmental enhancements was assessed in a reversal experimental design as we collected data on daily participation at the center. Performance on fine motor skills subtests of the Brigance K & 1

Screen (1982) at the beginning, middle, and end of this research served as a correlative measure.

Previous research has been geared toward developing direct instructional procedures for specific prewriting skills such as pencil grasp (Mendoza, Holt, & Jackson, 1978); directional tracking (Sterritt, 1976); letter reversals (Enstrom & Enstrom, 1969); and writing on large-spaced and normal-spaced paper (Waggoner, 1981). To the best of our knowledge, however, procedures to develop prewriting motor skills in general with a developmentally appropriate teaching style in the applied setting of a preschool classroom have not been researched. Professionals in the domain of early writing and reading have recommended some of the environmental characteristics in the present study such as daily time and opportunity, varied materials, and teacher support for the practice of skills (Clay, 1975; Harste, Woodward, & Burke, 1984; King & Rentel, 1981; Vukelich & Golden, 1984).

Method

Subjects

The children were enrolled in a preschool classroom of the

Nineteen children (seven boys and twelve girls) with a mean age of 4-1 (range of 2-11 to 5-0) participated during the fall semester. Due to enrollment changes of one child leaving and two new children entering the class, twenty children (seven boys and thirteen girls) with a mean age of 4-4 (range of 3-4 to 5-5) participated during the spring semester. One of these twenty left before the spring semester ended. All these children were considered typical by teacher reports.

Setting

This study was conducted in the natural setting of the preschool classroom, which operated Monday through Thursday from 12:30 p.m. to 3:00 p.m. The daily schedule was indoor free-choice, small preacademic groups, snack, large group, and outdoor play. One of the centers offered during the free-choice period (50 min) was the Prewriting Table. Other centers available were Blocks and Dramatic Play, Art, Science, Language Experience, Reading Corner, and Manipulative Activities (e.g., puzzles, pop beads, lego). Children could enter or leave these centers as they chose.

The Prewriting Table was near the middle of the room. The Table was six-sided (approximately 45 cm x 104 cm) and had six child-size chairs placed around it. To the left of the Table was a bookcase (90 cm x 121 cm) with three shelves used to store extra materials, as specified in several experimental conditons.

Materials

The materials used at the Prewriting Table are listed in Table 1.

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Insert Table 1 About Here
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Each of the eight categories had two materials/activities concentrating on the same fine-motor skill. One activity was a low or less difficult task, (e.g., fuzzyballs and tongs), the second was high or more difficult (e.g., beans and tweezers).

At the Prewriting Table six colored-ribbon necklaces, each with a single wooden bead, were placed around the backs of the chairs. A necklace was worn around the child's neck when he or she chose to participate at the Table and returned to the back of the chair upon leaving.

Experimental Design

An A1, B, A2, C, A3, D1, A4, D2 reversal design was implemented to study the effects of the environmental enhancements on overall quantity of participation and the working proficiency quality ratings of constructive, non-constructive, and idle participation at the Prewriting Table. Each of the experimental conditions lasted two weeks (eight school days). If the quantity or quality of child participation was reversed during Condition B, C, or D, from the immediate preceeding and succeeding Condition A, then experimental control was shown by the environmental enhancements implemented in the Condition B, C, or D.

Across all experimental conditions the same eight categories of materials/activities were used, but in a different random order. Thus the counterbalancing of these categories preempted condition changes due to materials or their ordering effects.

Procedures

Brigance Testing

All children were tested prior to the beginning of the study in the fall semester (with the exception of two children who entered the program during the spring semester) on two subtests of the Brigance K & I Screen [(1) prints personal data, and (2) visual motor skills]. Brigance testing was repeated prior to the beginning of the spring semester and following the end of the study, to assess any change in scores after a semester's participation at the Prewriting Table with its environmental changes.

Selection of Prompted Children

Five children were selected to be prompted to attend the Prewriting Table on the basis of low scores on the initial Brigance subtests as shown in Table 2. The maximum score for the combined subtests was 15. These five had scores of 0 or 2. The sixth child was selected on a somewhat subjective

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Insert Table 2 About Here
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basis; this child had a Brigance score of 4, as did two nonprompted children. It was felt this sixth child needed special teacher help in general in the classroom. To keep the prompting procedure manageable this group was limited to six.

Data Collection

A primary observer collected data daily on the following: constructive, non-constructive, and idle participation for each child at the Prewriting Table. These three subcategories were added together for a total participation score. Behaviors were sampled and recorded at the beginning of each 3 minute interval by scanning the six chairs and recording only one occurrence in each interval for each child at the table. Data were taken during the middle 30 minutes of the free-choice period, a time when typically all children had arrived and all centers were open.

Besides the participation data the primary observer also noted what materials were at the Table and the bookcase and whether a teacher was present. When prompts were delivered to specific children, the teaching staff recorded their own prompts and reported the number to the primary observer who totaled all prompts per child per day.

Reliability

The primary observer and another independent observer collected reliability data for eight sessions, once for each condition; additionally these reliability checks were scheduled for each category of materials/activities. The independent reliability observer stood next to the primary observer during 30 minute data collection sessions. Both observers stood behind chair number four and, when a beeper set for 3 minute intervals sounded, rotated collecting data in a clockwise manner beginning at chair one, with the primary observer repeating the following count, "one, look, record; two, look, record; three, look, record..." terminating the count after recording at chair six. This procedure occurred ten times during the 30 minutes of observation.

Reliability data were calculated on the total participation by children at the Prewriting Table, and the constructive, non-constructive, and idle participation. Occurrence and nonoccurrence reliabilities were scored according to the following formulas:

Occurrence:

$$R\% = \frac{\text{Agreements of Occurrence}}{\text{Agreements and Disagreements of Occurrence}} \times 100$$

Nonoccurrence:

$$R\% = \frac{\text{Agreements of Nonoccurrence}}{\text{Agreements and Disagreements of Nonoccurrence}} \times 100$$

The occurrence reliability for total participation at the Prewriting Table ranged from 78% to 100%, with a mean of 94%. Occurrence reliability for constructive participation was a mean of 93% (83% - 100% range); non-constructive participation, mean of 91% (78% - 100% range); idle

participation, 100% across all conditions. Nonoccurrence reliabilities for participation and the three manners of working proficiency were 100% across all conditions.

Reliability was not taken on the occurrence of teacher prompts in Conditions C, D1, and D2 because such reliability manpower was not available.

Condition A 1, 2, 3, & 4: One Skill Level

In Condition A, six similar materials, one in front of each chair, were available at the Prewriting Table. The difficulty level of high or low alternated every other day across the eight days of the conditon. On each of the eight days a different category of materials/activities was presented. When this Condition was repeated, the same eight categories were used in a different random order with the high/low levels reversed.

The teaching staff was instructed not to prompt children to participate at the Prewriting Table. A teacher was not present at the Table to work with the children.

Condition B: Two Skill Levels

In Condition B, six materials, one in front of each chair, were available at the Prewriting Table, and six materials were placed on the shelves next to the Table available for self-choice. All materials were of one category, and two difficulty levels, six high and six low, were available each day. At the Table there were three high-level and three low-level activities. On the shelves there were three high, and three low. On each of the eight days a different category of materials was presented. No children were prompted, and a teacher was not at the Table.

Condition C: Two Skill Levels, Teacher Prompts

Condition C was the same as Condition B with the addition of teacher prompts to six specific children. The four teachers in the classroom were requested to deliver one or two individualized, not standardized, prompts to attend the Prewriting Table per session per child, only when the child was not engaged in another center, to keep the number of prompts in a reasonable range. The children were free to refuse the prompts.

Conditions D1 & D2: Two Skill Levels, Teacher Prompts, Teacher Presence

Conditions D1 & D2 were the same as Condition C with the addition of a teacher present at the Prewriting Table during the entire free-choice period. The same six children as in Condition C received teacher prompts to participate.

Experimental Variables and Definitions

Dependent Variable

The dependent variable was child participation at the Prewriting Table. Participation was defined as beginning when a child placed a necklace, from the back of a chair, around his or her neck and ended when the necklace was taken off and replaced on the chair. Constructive and non-constructive participation were defined for each of the 18 materials/activities. Idle participation was defined as sitting or standing at the Table wearing a necklace without having physical contact with the materials.

Independent Variables

The independent variables were the environmental enhancements of two skill levels instead of one, teacher verbal prompts directed toward the same six children, and teacher presence at the Prewriting Table.

Results

Participation

Figure 1 shows the group means for participation at the Prewriting Table for each experimental condition. The participation percentage was

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calculated by dividing the actual number of minutes of participation by the number of minutes available in a condition (30 minutes of observation x six chairs x eight sessions). The levels of participation were higher during Conditions D1 (64%) and D2 (65%) which consisted of two fine-motor skill level activities, teacher prompts, and teacher presence, in comparison to all other conditions. In A1 (21%), A2 (19%), A3 (21%), and A4 (20%) Conditions, which all consisted of one fine-motor skill level activity, participation percentages were always lower than the succeeding or preceding B (34%), C (42%), D1 or D2 Conditions. Thus participation behavior consistently reversed in the A1, B, A2, C, A3, D1, A4, D2 experimental design.

Using the B, C, D1, and D2 percentages as orthogonal components in tests for the trend resulted in $F = 13.77$ which is significant using the Scheffé method of a posteriori tests (critical value $.01\ F_{K = 4} = 13.02$). A few individuals did not follow this group trend, but the six children who received prompts did. For each condition in which prompts were given the mean number of prompts per child was 6 with a range from 2-10.

Working Proficiency

Figure 2 shows the group mean percentages for working proficiency which was subdivided into constructive, non-constructive, and idle across all

experimental conditions. Working proficiency percentages were calculated by

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Insert Figure 2 About Here
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dividing the total number of minutes of group participation by the total number of minutes working in a constructive, non-constructive, or idle manner for each condition. The group means across conditions for constructive, non-constructive or idle did not vary significantly. Considering all conditions combined, however, there was a significant difference between constructive (72%) and non-constructive (23%) participation (.05 F 3,8 = 4.07; value = 5.23). There was a significant difference found between non-constructive (23%) and idle (5%) participation (.05 F 3,8 = 4.07; value = 7.117). Thus, children were significantly more constructive than non-constructive with a small amount of idle participation throughout the entire study. A few individuals, including some prompted and nonprompted, did not follow this group trend.

Materials Usage

The participation data combined for all experimental conditions for each of the eight categories of materials/activities were examined to assess whether any one material had significantly higher participation than another; no one had. The mean participation percentages for the eight categories were: 1) 43.12%; 2) 40.37%; 3) 29.12% 4) 31.25%; 5) 30.00% 6) 44.25%; 7) 22.00%; and 8) 47.25%. The lowest participation was with lacing cards, and the highest was with the writing worksheets.

Brigance Testing

Table 2 shows scores on the Brigance K & I Screen successively improved from Pretest to Posttest I to Posttest II for 17 of the 21 children; the six prompted children were among these 17. Two children who entered the program midway through the study increased their initial scores on the final test.

A T test of comparison of means demonstrated significant differences from Pretest to Posttest I and from Pretest to Posttest II. The proportioned level of significance is .95 F 3,20 = .5773 for the critical value for a range of 0 - 15. The significant comparisons were 1.82 between Pretest and Posttest I and 1.79 between Pretest and Posttest II. There was no significant difference between Posttest I and Posttest II.

Discussion

Throughout the school year these children participated more and more at the Prewriting Table on a voluntary basis and in a constructive manner even with simultaneous offerings in six other free-choice centers in the preschool. The reversal experimental design demonstrated that time alone was not the cause of the increase. The counterbalancing of the eight categories of materials in each experimental condition assured that neither the materials nor their ordering was the cause. The augmented participation at the Prewriting Table likely was due to its cumulative additions of environmental enhancements: first, adding two skill levels of materials instead on one; next, adding prompts to participate to specific children who had low fine-motor test scores; finally, adding continuous teacher presence. Why was each of these enhancements effective?

When materials of two skill levels (high and low) are available on a self-choice basis, a child may select the one he or she feels best matched

to personal ability, and thus success is imminent; or the one of most interest, and thus motivation is intrinsic; or, the same one a buddy is using, and thus sociability or peer teaching is promoted; or, both, and thus the stimulation of variety ensues. Even this limited self-selection seems to be reinforcing to a child for these speculated reasons. A wider variety of materials than used in this study is recommended to promote interest over time.

A prompt related to a particular child's feelings and timed with the child's unoccupied behavior seems to be the key to successful prompting as shown by the increasing participation data of the six prompted children. For instance, a shy child might be prompted to make a new friend at the Table; a nonadventurous child might be encouraged to try new materials; and a perfectionist might be advised that mastery comes with repeated trying. It is suggested that prompts to attend the Prewriting Table might be given not only to children who are not adept in their fine-motor performance but also to those who seldom participate.

Teacher presence in any activity seems to be reinforcing to children. A teacher models and instructs the desired behavior; makes corrections before incorrect habits are formed; praises children for their attempts and accomplishments; and promotes sociability--all these teacher behaviors have positive effects on children.

The three environmental enhancements at the Prewriting Table not only increased participation but also were developmentally appropriate for young children in that they were child-centered. Children had their choice of materials. The prompts, which could always be refused, were tailored to the type of encouragement it was felt the children needed and were given only

when the children were unoccupied. The teacher moved around the table to assist and praise each child individually. These three enhancements along with the child's voluntary coming and going made the Prewriting Table child-centered.

The Behavior Analysis Sequenced Handwriting Worksheets (drawing of simple lines gradually shaping into letters) were the most popular materials as demonstrated by the participation data when they were available, though that participation was not significantly higher than for other materials. The first 11 of these worksheets were assigned to a low-level activity and the next 11 to the high-level. Random selections from each set of 11 were made according to whether a session called for low-level, high-level, or both levels of activities. Over the school year, then, in a restricted sense, a wider variety of materials was offered in the worksheet category than the other categories.

The popularity of these worksheets might be that the children liked their variety, or the worksheets themselves, or the take-home product to their parents for praise. The only other take-home products were the free-hand coloring and stencil tracing sheets in Category II which was fourth in popularity according to participation data. Conceivably the parents praised their children more for handwriting worksheets than the coloring and tracing sheets. The early childhood profession does not recommend worksheets with rote practice of isolated skills for this age group (NAEYC, 1986), yet these children used them extensively within the context of the child-centered Table.

From Pretest to Posttest II Brigance fine-motor scores improved significantly and covaried with the school-year-long increasing

participation at the Prewriting Table. Test scores might have improved either due to participation at the Table or normal developmental growth. For these children this improvement might have been reinforcing and in turn contributed to their coming to the Table more frequently and completing tasks at the table more often.

With the trend in formal instruction in preacademics (Mills & Spooner, 1988) it is likely that many preschool teachers will be teaching prewriting. The results of this study suggest prewriting can be taught successfully in a child-centered manner. The availability of different levels of a variety of activities, not dominated by structured abstract materials, and teacher presence at a Prewriting Table along with prompts to children to attend this self-choice center will keep it a busy place with constructive work on a daily basis.

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Table 1

Prewriting Table Materials/Activities

Category	Low Level	High Level
I	Cornmeal Writing	Chalkboard Writing
II	Freehand Coloring	Stencil Tracing
III	Fuzzyballs & Tongs	Beans & Tweezers
IV	Large-Peg Tray	Small-Peg Tray
V	Scissors Cutting Straight Lines	Scissors Cutting Curved Lines
VI	Eyedropper/Water/Cup	Toothpicks/Jars/ Perforated Lids
VII	Lacing Cards Teddy Bears	Lacing Cards Dinosaurs
VIII	Writing Worksheets Behavior Analysis 1-11	Writing Worksheets Behavior Analysis 12-22

Table 2

Chronological Ages and Brigance Scores*

Child	Chronological Age & Brigance Scores					
	Pretest		Posttest I		Posttest II	
	Age	Score	Age	Score	Age	Score
**1	4-2	0	4-7	0	4-10	2
**2	3-0	4	3-5	4	3-8	7
**3	4-5	2	4-10	4	5-1	5
**4	3-1	2	3-6	6	3-9	9
**5	2-11	0	3-4	4	3-7	6
**6	4-5	2	4-10	11	5-1	13
7	4-3	13	4-8	11	4-11	12
8	4-0	6	4-5	13	4-8	12
9	4-9	15	5-2	15	5-5	14
10	4-5	8	4-10	15	5-1	15
11	4-4	8	4-9	15	5-0	15
12	4-3	4	4-8	8	4-11	10
13	\	\	4-11	8	5-2	10
14	4-1	4	4-6	9	4-9	10
15	4-8	6	5-2	13	\	\
16	4-4	11	4-9	13	5-0	14
17	5-0	13	5-5	15	5-8	15
18	4-8	11	5-1	9	\	\
19	4-7	13	5-0	15	5-3	14
20	3-3	6	3-8	6	3-11	10
21	\	\	4-3	6	4-6	12

*The scores presented are for both the Prints Personal Data (5 pt.) and Visual Motor Copying Skill (10 pt.) Subtests on the Brigance K & I Screen for Kindergarten and First Grade (1982).

**Children receiving prompts

Prewriting Table

Figure 1. Group mean percentages of time spent at the Prewriting Table across the experimental conditions. To calculate the percentages, the group's total number of minutes of participation for each condition was divided by the total number of minutes available during each condition (six chairs x 30 min x eight days).

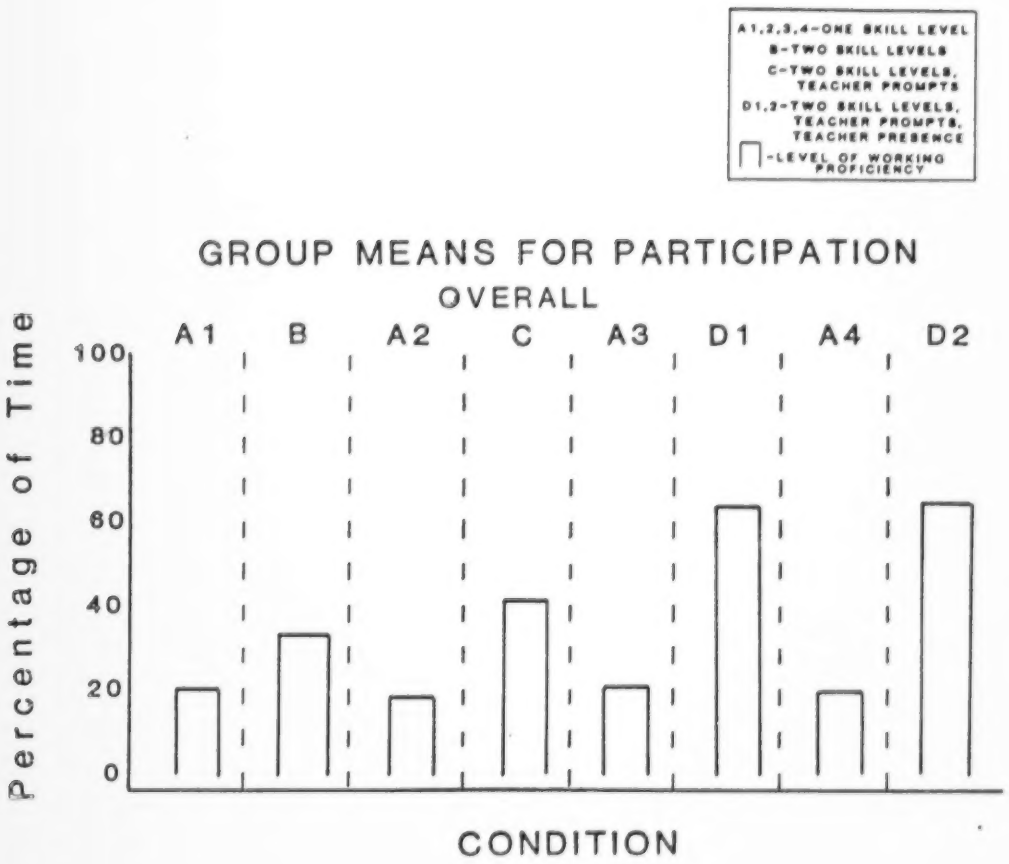
A1,2,3,4-ONE SKILL LEVEL
B-TWO SKILL LEVELS
C-TWO SKILL LEVELS, TEACHER PROMPTS
D1,2-TWO SKILL LEVELS, TEACHER PROMPTS, TEACHER PRESENCE
-LEVEL OF WORKING PROFICIENCY
GROUP MEANS FOR PARTICIPATION
OVERALL
A1
B
A2
C
A3
D1
A4
D2
100
80
60
40
20
0
Percentage of Time
CONDITION

Figure 2. Group mean percentages for the three subcategories of working proficiency--constructive, non-constructive, and idle participation--across the experimental conditions. To calculate the percentages, the group's total number of minutes spent working in a constructive, non-constructive, or idle manner was divided by the total number of minutes at the Table.

GROUP MEANS FOR WORKING PROFICIENCY